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REMARKS

In view of the above amendments and the following remarks, reconsideration of the outstanding office action is respectfully requested.

The rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (1st para.) for lacking adequate written descriptive support for the phrase "commercially appealing," is respectfully traversed in view of the above amendments.

The rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (1st para.) for lack of enablement is respectfully traversed.

The U.S. Patent and Trademark Office ("USPTO") has taken the position that, in order to overcome this rejection, applicant must provide evidence that the following parental plants are either commercially available or available through the U.S. National Germplasm System ("NPGS"): Cornell ZPPM 339; TAM Uvalde; UC Topmark; Oro Rico; Galia type; Ananas type; PI 157082; PI 511890; PI 482399; PI 482398; and PI 140471. In response to the USPTO's requirement, applicant submits herewith a Declaration of Margaret M. Jahn Under 37 C.F.R. § 1.132 (the "Jahn Declaration"). As described in more detail below, the Jahn Declaration affirmatively states that each of the above-identified parental plants are either commercially available or available through the NPGS (Jahn Decl. ¶¶ 4-11).

PI 157082, PI 511890, PI 482398, PI 482399, and PI 140471 are each *Cucumis melo* plant introductions that have been deposited with the NPGS of the Agricultural Research Service ("ARS") branch of the United States Department of Agriculture ("USDA") (Jahn Decl. ¶ 6). Current NPGS records show that all of the above PIs are being maintained at NPGS's North Central Regional Plant Introduction Station repository (at Iowa State University, Ames, Iowa), and that they are all available for distribution to the public by this repository (*Id.*) (*see* **Exhibit 1** attached to the Jahn Declaration).

Cornell ZPPM 339 is a gummy stem blight susceptible *Cucumis melo* breeding line developed by plant breeders at Cornell University, Ithaca, New York. Cornell ZPPM 339 is described in the present application (at page 20, lines 23-26) and in the literature as being "well-adapted to greenhouse and field conditions, and monoecious, which eliminates the need for emasculation when used as a female parent" (*see* Zuniga et al., "Monogenic Dominant Resistance to Gummy Stem Blight in Two Melon (*Cucumis melo*) Accessions," Plant Disease 83(12):1105-1107 (1999) (attached to the Jahn Declaration as **Exhibit 2**) (Jahn Decl. ¶ 7). It is well-known in the field of melon breeding that Cornell ZPPM 339 is available from the Department of Plant Breeding at Cornell University, Ithaca, New York, by request (*Id.*). Applicant was involved with breeding the

Cornell ZPPM 339 line (*Id.*). When applicant receives requests for this breeding line, seeds are sent to the requester at no charge (*Id.*).

TAM Uvalde is a gummy stem blight susceptible *Cucumis melo* cultivar that has been deposited as identifier number "NSL 92623" with the NPGS National Center for Genetic Resources Preservation (Fort Collins, Colorado) repository (Jahn Decl. ¶ 8) (*see* page 1 of **Exhibit 3** attached to the Jahn Declaration). Upon request, TAM Uvalde is available for distribution to the public by this repository (Jahn Decl. ¶ 8) (*see* page 2 of **Exhibit 3** attached to the Jahn Declaration).

UC Topmark (also known as "Top Mark") is a gummy stem blight susceptible *Cucumis melo* cultivar that has been deposited as identifier number "NSL 30032" with the NPGS North Central Regional PI Station (Ames, Iowa) repository (Jahn Decl. ¶ 9) (*see* page 3 of **Exhibit 3** attached to the Jahn Declaration). Upon request, UC Topmark is available for distribution to the public by this repository (Jahn Decl. ¶ 9) (*see* page 4 of **Exhibit 3** attached to the Jahn Declaration). Galia and Ananas are types of gummy stem blight susceptible *Cucumis melo* cultivars that are well-known in the field of melon breeding (Jahn Decl. ¶ 10). Both the Galia type and Ananas type melons are commercially available from various seed companies, including, for example, Hollar Seeds (Rocky Ford, Colorado) (*see* pages 1-8 of **Exhibit 4** attached to the Jahn Declaration) and United Genetics, Inc. (Hollister, California) (Jahn Decl. ¶ 10) (*see* pages 9-13 of **Exhibit 4** attached to the Jahn Declaration). Oro Rico is a gummy stem blight susceptible *Cucumis melo* cultivar that is commercially available from Harris Moran Seed Company (Modesto, California) (Jahn Decl. ¶ 11) (*see* **Exhibit 5** of the Jahn Declaration).

As demonstrated above, each of the parent plants recited in the claims are either commercially available or available through the NPGS. However, the USPTO has indicated that there must also be a guarantee that these plants will be available for a period of 30 years or 5 years after the last request or for the enforceable life of the patent, whichever is longer (*see* Office Action, page 4). Applicant respectfully disagrees. Because there is no reasonable basis to believe that the parent plants recited in the claims will cease to be available during the enforceable life of a patent issuing from the present application, current availability of these parent plants should be sufficient to meet the enablement requirement under 35 U.S.C. § 112 (1st para.). *See* Manual of Patent Examining and Procedure ("MPEP") § 2404.01.

The USPTO has also based this enablement rejection on its view that there must be an explicit acknowledgement that all restrictions on the public availability of the breeding line designated as NY 01-190-3R,-7L-9L (composite), and deposited as ATCC

Accession No. PTA-3860, will be irrevocably removed upon granting of the present application as a patent (*see* Office Action, page 4). Paragraph 12 of the Jahn Declaration specifically states that NY 01-190-3R,-7L-9L (composite) was deposited with the ATCC in conformity with the requirements of the Budapest Treaty. In particular, as shown in the ATCC deposit application form (*see* page 3 of the **Exhibit 6** attached to the Jahn Declaration), if the present application issues as a U.S. patent, the NY 01-190-3R,-7L,-9L (composite) breeding line will be available to anyone who requests it (Jahn Decl. ¶ 12).

For the foregoing reasons, applicant respectfully submits that the rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (1st para.) for lack of enablement is improper and should be withdrawn.

The rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (1st para.) for lack of an adequate written description is respectfully traversed in view of the above amendments and the following remarks.

The USPTO has taken the position that, in order to adequately describe the invention, the specification must define the recited parental and progeny plants in terms of their genomic structure or phenotypic characteristics. Applicant respectfully submits that the amendments to the claims are sufficient to overcome this ground of rejection. In particular, claims 1, 22, and 45 have been amended to recite that the parental plants include a "recurrent *Cucumis melo* parent plant having commercially appealing attributes" and a "non-recurrent *Cucumis melo* parent plant having resistance to gummy stem blight." Descriptive support for these amendments are found in the specification at page 9, lines 17-30, page 10, line 27 to page 12, line 21, page 14, line 3 to page 16, line 23, and page 27, line 28 to page 32, line 7.

The claims also recite that the recurrent parent plants correspond to the non-resistant cultivars of Cornell ZPPM 339, TAM Uvalde, UC Topmark, Galia type, Ananas type, and Oro Rico, while the non-recurrent parent plants correspond to the resistant cultivars of PI 157082, PI 511890, PI 482399, PI 482398, and PI 140471. One of ordinary skill in the field of plant breeding would readily know that the recurrent parent contributes the "commercially appealing attributes" and that the non-recurrent parent contributes the gummy stem blight resistance.

Claims 1, 22, and 45 have further been amended to recite the following additional steps after the initial cross: (i) "backcrossing the recurrent parent plant with the first generation hybrid plant to yield a first backcross plant" and (ii) "performing backcrosses of the recurrent parent plant with progeny of the first backcross plant under conditions effective to yield the gummy stem blight resistant *Cucumis melo* hybrid seed, wherein said

hybrid seed produces a plant having the commercially appealing attributes of the recurrent parent plant and having enhanced resistance to gummy stem blight compared to the recurrent parent plant." Descriptive support for these amendments are found in the specification at page 9, lines 17-30, page 10, line 27 to page 12, line 21, page 14, line 3 to page 16, line 23, and page 27, line 28 to page 32, line 7.

The claims further recite that the "commercially appealing attributes" of the recurrent parent and the gummy stem blight resistant *Cucumis melo* hybrid seed include "enhanced seed yield, enhanced fruit size, enhanced fruit quality, enhanced fruit shelf life, enhanced seedling vigor, enhanced disease tolerance, enhanced insect tolerance, resistance to pesticides, resistance to herbicides, enhanced stems, enhanced roots, heat tolerance, drought tolerance, or enhanced maturity rate." Descriptive support for this amendment is found in the specification at page 5, line 29 to page 6, line 2, and page 13, lines 15-17.

In view of the above-described amendments to the claims, applicant respectfully submits that one of ordinary skill in the art would readily know the phenotypic characteristics of the parent plants and the progeny of the crosses between the parent plants. Thus, for the foregoing reasons, applicant respectfully submits that the rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (1st para.) for lack of an adequate written description is improper and should be withdrawn.

The rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (2nd para.) for indefiniteness is respectfully traversed in view of the above amendments and the following remarks.

With respect to claims 20 and 21, the USPTO has taken the position that these claims are indefinite because of the lack of certain clear, positive method steps. In particular, the USPTO has asserted that claim 20 lacks the method steps of the "traditional plant breeding techniques," while claim 21 fails to clearly define the meaning of the phrase "tissue culture techniques." Claim 20 has been amended to recite that the "second gummy stem blight resistant *Cucumis melo* plant either comprises a gummy stem blight resistant *Cucumis melo* plant selected from the group consisting of PI 157082, PI 511890, PI 482399, PI 482398, and PI 140471, or is derived from said gummy stem blight resistant *Cucumis melo* plant using a breeding program comprising backcrossing the gummy stem blight resistant *Cucumis melo* plant with the recurrent parent plant for at least three generations coupled with traditional plant breeding techniques selected from the group consisting of pedigree breeding, selfing, and intercrossing." Descriptive support for this amendment is found in the specification at page 10, line 32 to page 16, line 23, page 27, line 28 to page 32, line 7. Claim 21 has been amended to recite that the "tissue culture techniques" can include

"micropropagation, meristem culture, somatic embryogenesis, somaclonal variation, *in vitro* selection, protoplast culture, somatic hybridization, and double-haploid breeding." Descriptive support for this amendment is found in the specification at page 16, line 28-32.

Regarding claim 67, the USPTO has asserted that the recitation of the term "(composite)," as used to identify breeding line NY 01-190-3R-7L-9L (composite), renders the claim indefinite. Applicant respectfully disagrees. The phrase "breeding line," as used in the field of plant breeding, is commonly known by those of skill in that art to identify plants that are genetically uniform. The Jahn Declaration supports this view, and states that the term "composite," as used to describe this breeding line, means that the seeds comprising ATCC Accession No. PTA-3860, while genetically uniform, were collected from the following three plants: (i) NY 01-190-**3R**; (ii) NY 01-190-**7L**; and (iii) NY 01-190-**9L** (emphasis added to show the differences) (Jahn Decl. ¶ 12). The last two digits of each plant number designates the location of the individual plant within the field row in which "NY 01-190" was planted (*Id.*).

For the foregoing reasons, applicant respectfully submits that the rejection of claims 1, 18-22, 39-43, 45, 62-65, and 67-73 under 35 U.S.C. § 112 (2nd para.) for indefiniteness is improper and should be withdrawn.

The rejection of claims 1, 18-20, 22, 39-41, 43, 45, 62, 63, and 65 under 35 U.S.C. § 103(a) for obviousness over either Prasad et al., "Inheritance of Resistance to *Mycosphaerella citrullina* in Muskmelon," J. Amer. Soc. Hort. Sci. 91:396-400 (1967) ("Prasad") or Norton et al., "AC-70-154, A Gummy Stem Blight-Resistant Muskmelon Breeding Line," HortScience 24(4):709-711 (1989) ("Norton"), each in view of Kalb et al., "Evaluation of Combining Ability, Heterosis, and Genetic Variance for Fruit Quality Characteristics in Bush Muskmelon," J. Amer. Soc. Hort. Sci. 109(3):411-415 (1984) ("Kalb"), Zhang et al., "Screening Melon (*Cucumis melo*) for Resistance to Gummy Stem Blight in the Greenhouse and Field," HortScience 32(1):117-121 (1997) ("Zhang"), and Applicant's admission, is respectfully traversed.

Prasad describes gummy stem blight resistant hybrids arising from crosses of PI 140471 with six different parents having various levels of resistance or susceptibility. The six parents were identified as HD-2 (Honey Dew #2), HBJ (Hales Best Jumbo), SP (Smith Perfect), C-8, A-4, and C-1. Norton describes a gummy stem blight resistant muskmelon breeding line, AC-70-154, which originated from the cross PI 140471 x Georgia 47 (a susceptible melon cultivar), and which was developed through a program of backcrossing, disease screening, and inbreeding (i.e., selfing and sibbing). Kalb describes various fruit quality characteristics of a number of muskmelon breeding lines, including U.C. Top Mark.

Zhang describes a number of *C. melo* PI accessions as having resistance to gummy stem blight, including accessions such as PI 140471, PI 157082, PI 511890, PI 482398, and PI 482399. Applicant's admission refers to the specification's statement that resistance genes *Gsb1, Gsb2, Gsb4, Gsb5,* and *gsb3* are found in PI 140471, PI 157082, PI 511890, PI 482398, and PI 482399, respectively.

The USPTO continues to take the position that it would have been obvious to one of ordinary skill in the art to use the breeding lines and gummy stem blight resistant PI accessions of Kalb and Zhang in the methods of Prasad and Norton to produce gummy stem blight resistant hybrids. Applicant respectfully disagrees.

A proper *prima facie* showing of obviousness requires the USPTO to satisfy three requirements. First, the prior art relied upon, coupled with knowledge generally available to one of ordinary skill in the art, must contain some suggestion which would have motivated the skilled artisan to combine or modify references. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Second, the USPTO must show that, at the time the invention was made, the proposed modification had a reasonable expectation of success. See Amgen v. Chugai Pharm. Co., 927 F.2d 1200, 1209, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Finally, the combination of references must teach or suggest each and every limitation of the claimed invention. See In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

Application of these standards to the present invention demonstrates that the USPTO has failed to establish a *prima facie* case of obviousness for several reasons.

The USPTO has asserted that, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the methods of Prasad and/or Norton to incorporate the *C. melo* varieties described in Kalb and/or Zhang to yield the gummy stem blight resistant *C. melo* seeds of the present invention. In particular, the USPTO bases this assertion on its view that one of ordinary skill in the art would have been motivated to combine non-resistant *C. melo* lines such as those disclosed in Kalb (e.g., UC Topmark) with gummy stem blight resistant accessions such as those disclosed in Zhang (e.g., PI 140471) as part of a breeding program for producing gummy stem blight resistant melons.

Claims 1, 18, 19, 22, 39, 45, 67, and 73 have been amended to delete the phrase "commercially appealing," as previously recited in these claims. As described above, claims 1, 22, and 45 have been amended to recite that the gummy stem blight resistant *Cucumis melo* hybrid seed and plants have the "commercially appealing attributes of the recurrent parent plant" and "enhanced resistance to gummy stem blight compared to the

recurrent parent plant." The recurrent parents are identified as including Cornell ZPPM 339, TAM Uvalde, UC Topmark, Galia type, Ananas type, and Oro Rico. The claims also indicate that the source of resistance to gummy stem blight is provided by the non-recurrent parent (i.e., PI 140471, PI 157082, PI 511890, PI 482398, and PI 482399). Thus, the claimed gummy stem blight resistant *Cucumis melo* hybrid plants (or seeds) of the present invention are phenotypically limited in that they have the commercially appealing attributes of the recurrent parent and the enhanced gummy stem blight resistance contributed by specific non-recurrent (i.e., resistant) parent plants. Although the cited references teach the non-recurrent parents and one of the recurrent parents (i.e., UC Topmark), none of these references, alone or in combination, teach or suggest a gummy stem blight resistant *Cucumis melo* hybrid plant or seed produced by crossing the recurrent and non-recurrent parent plants recited in the claims (*see* Jahn Decl. ¶ 13).

As discussed below, even if, assuming *arguendo*, there were some suggestion of combining the teachings of Prasad, Norton, Kalb, and Zhang (which there is none), there has been no showing by the USPTO of a reasonable expectation of success in achieving the presently claimed invention. Regarding Prasad, the purpose of the crossing experiments reported therein was to determine the mode of inheritance (e.g., *via* single dominant resistance gene) of the gummy stem blight resistance trait from the resistant wild *Cucumis melo* accession PI 140471. Nowhere does Prasad show or suggest that crossing PI 140471 with any of the non-resistant *Cucumis melo* varieties recited in the claims of the present invention would yield the *Cucumis melo* hybrid plant or breeding line of the present invention. Norton is limited to crossing PI 140471 (as the resistance source) and Georgia 47 (as the recurrent parent) to develop a gummy stem blight resistant muskmelon breeding line. Norton does not, however, teach or even suggest that crossing PI 140471 with other non-resistant recurrent parents (such as the non-resistant cultivars recited in the claims of the present invention) would be reasonably likely to succeed in yielding the *Cucumis melo* hybrids or breeding lines of the present invention. Zhang reports the results of screening various *Cucumis melo* cultivars to determine their level of resistance to gummy stem blight resistance, but does not discuss (or even involve) any crosses or breeding studies. Although Kalb reports on the effectiveness of crossing various *C. melo* breeding lines to yield hybrids with favorable fruit quality traits, nowhere does Kalb discuss using a gummy stem blight resistant melon to impart gummy stem blight resistance in hybrid plants or breeding lines. For the foregoing reasons, the USPTO has failed to show that, at the time the invention was made, the proposed modification of the methods of Prasad and Norton in view of the

disclosures of Kalb and Zhang had a reasonable expectation of succeeding in yielding the seeds, plants, tissue cultures, breeding lines, or plant parts of the present invention.

Thus, since the combination of Prasad, Norton, Kalb, and Zhang cannot even establish a *prima facie* case of obviousness, the rejection under 35 U.S.C. § 103 for obviousness over these references should be withdrawn.

The rejection of claims 21, 42, and 64 under 35 U.S.C. § 103(a) for obviousness over either Prasad or Norton, each in view of each of Kalb, Zhang, and Trulson et al., "*In vitro* Plant Regeneration in the Genus *Cucumis*," Plant Science 47:35-43 (1986) ("Trulson") is respectfully traversed. Trulson teaches tissue culture and plant regeneration techniques. However, because Trulson does not overcome the deficiencies of Prasad and Norton, as previously discussed herein, applicant respectfully submits that this rejection is improper and should be withdrawn.

The rejection of claims 67-73 under 35 U.S.C. § 102(b) as anticipated by or under 35 U.S.C. § 103 for obviousness over Prasad or Norton is respectfully traversed. The USPTO has asserted that the gummy stem blight plants of Prasad and Norton have the same characteristics as those of the NY 01-190-3R,-7L,-9L (composite) breeding line of the present invention. As discussed in the Jahn Declaration (at ¶ 12), the NY 01-190-3R,-7L,-9L (composite) breeding line is phenotypically and genotypically different from those plants described in Prasad and Norton. In particular, the NY 01-190-3R,-7L,-9L (composite) breeding line (i.e., ATCC Accession No. PTA-3860) has the following pedigree: [[[[ZPPM X (511890 X 482398)]F3 X [[[[TAM X (MAIN X 157082)]F2] X (MAIN X 157082)F2] X [TAM X (TM X 140471)]F3]F2]F2 X [[[ZPPM X (MAIN X 511890)]F3 X [[ZPPM X (MAIN X 140471)]F3]]OPF2 X [ZPPM339 X [511890 X 482399]F3]F2]F2 X [ZCPM339 X [ZPPM X [[ZPPM339 X (MAIN X 511890)]F3]]F2]F3]F3 (*see* Jahn Decl. ¶ 12). This shows that NY 01-190-3R,-7L,-9L (composite) was derived from recurrent and non-recurrent parent plants that are different from those of the above cited references (*see Id.*). Further, the level of gummy stem blight resistance demonstrated in the NY 01-190-3R,-7L,-9L (composite) breeding line is significantly higher than any of the hybrid plants described in the above cited references (*see Id.*).

For the foregoing reasons, applicant respectfully submits that the rejection of claims 67-73 under 35 U.S.C. § 102(b) as anticipated by or under 35 U.S.C. § 103 for obviousness over Prasad or Norton is improper and should be withdrawn.

In view of all of the foregoing, applicant submits that this case is in condition for allowance and such allowance is earnestly solicited.

Respectfully submitted,

Date: July 8, 2004

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CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR 1.8(a)]

I hereby certify that this correspondence is being:

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PATENT
Docket No.: **19603/3391 (CRF D-2702A)**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Margaret M. Jahn	Examiner: A. R. Kubelik
Serial No.	:	09/993,856	
Cnfrm. No.	:	7990	Art Unit: 1638
Filed	:	November 14, 2001	
For	:	RESISTANCE TO GUMMY STEM BLIGHT IN MELON	

DECLARATION OF MARGARET M. JAHN
UNDER 37 C.F.R. § 1.132

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, MARGARET M. JAHN, pursuant to 37 CFR § 1.132, declare:

1. I received a B.A. degree in Biology from Swarthmore College, Swarthmore, PA in 1980, and a Ph.D. degree in Plant Breeding from Cornell University, Ithaca, NY in 1988.

2. I am currently a Professor in the Department of Plant Breeding at Cornell University, Ithaca, New York.

3. I am the inventor of the above-identified patent application.

4. I am presenting this declaration for the following reasons: (i) to confirm the public availability of the parental plants described in my patent application; (ii) to confirm that all restrictions on the public availability of the plant line designated "NY 01-190-3R,-7L,-9L (composite)," and deposited as ATCC Accession No. PTA-3860, will be irrevocably removed upon issuance of my present patent application; and (iii) to explain the pedigree and composition of the NY 01-190-3R,-7L,-9L (composite) breeding line.

5. My present application makes reference to the following parental plants: PI 157082; PI 511890; PI 482398; PI 482399; PI 140471; Cornell ZPPM 339; TAM Uvalde; UC Topmark; Galia type; Ananas type; and Oro Rico. As described in more detail below, each of these parental plants are available to the public.

6. PI 157082, PI 511890, PI 482398, PI 482399, and PI 140471 are each *Cucumis melo* plant introductions that have been deposited with the National Plant Germplasm System ("NPGS") of the Agricultural Research Service ("ARS") branch of the United States Department of Agriculture ("USDA"). Current NPGS records show that all of the above PIs are being maintained at NPGS's North Central Regional Plant Introduction Station repository (at Iowa State University, Ames, Iowa), and that they are all available for distribution to the public by this repository (see **Exhibit 1**).

7. Cornell ZPPM 339 is a gummy stem blight susceptible *Cucumis melo* breeding line developed by plant breeders at Cornell University, Ithaca, New York. Cornell ZPPM 339 is described in my present application (at page 20, lines 23-26) and in the literature as being "well-adapted to greenhouse and field conditions, and monoecious, which eliminates the need for emasculation when used as a female parent" (see Zuniga et al., "Monogenic Dominant Resistance to Gummy Stem Blight in Two Melon (*Cucumis melo*) Accessions," Plant Disease 83(12):1105-1107 (1999) (attached hereto as **Exhibit 2**)). It is well-known in the field of melon breeding that Cornell ZPPM 339 is available from the Department of Plant Breeding at Cornell University, Ithaca, New York, by request. I was involved in breeding the Cornell ZPPM 339 line. When we receive requests for this breeding line, seeds are sent to the requester at no charge.

8. TAM Uvalde is a gummy stem blight susceptible *Cucumis melo* cultivar that has been deposited as identifier number "NSL 92623" with the NPGS National Center for Genetic Resources Preservation (Fort Collins, Colorado) repository (see **Exhibit 3**, at page 1). Upon request, TAM Uvalde is available for distribution to the public by this repository (see **Exhibit 3**, at page 2).

9. UC Topmark (also known as "Top Mark") is a gummy stem blight susceptible *Cucumis melo* cultivar that has been deposited as identifier number "NSL 30032" with the NPGS North Central Regional PI Station (Ames, Iowa) repository (see **Exhibit 3**, at page 3). Upon request, UC Topmark is available for distribution to the public by this repository (see **Exhibit 3**, at page 4).

10. Galia and Ananas are types of gummy stem blight susceptible *Cucumis melo* cultivars that are well-known in the field of melon breeding. Both the Galia type and Ananas type melons are commercially available from various seed companies, including, for example, Hollar Seeds (Rocky Ford, Colorado) (see **Exhibit 4**, at pages 1-8) and United Genetics, Inc. (Hollister, California) (see **Exhibit 4**, at pages 9-13).

11. Oro Rico is a gummy stem blight susceptible *Cucumis melo* cultivar that is commercially available from Harris Moran Seed Company (Modesto, California) (see **Exhibit 5**).

12. "NY 01-190-3R,-7L,-9L (composite)" is a gummy stem blight resistant *Cucumis melo* breeding line that has been deposited with the American Type Culture Collection ("ATCC"), Manassas, Virginia, and designated as ATCC Accession No. PTA-3860 (see **Exhibit 6**, at page 1). This ATCC deposit was made by me in conformity with the requirements of the Budapest Treaty. In particular, as shown in the ATCC deposit application form (see **Exhibit 6**, at page 3), if the present application issues as a U.S. patent, the NY 01-190-3R,-7L,-9L (composite) breeding line will be available to anyone who requests it. ATCC Accession No. PTA-3860 is a collection of seeds having the following pedigree: [[[[ZPPM X (511890 X 482398)]F3 X [[[[TAM X (MAIN X 157082)]F2] X (MAIN X 157082)F2] X [TAM X (TM X 140471)]F3]F2]F2 X [[[ZPPM X (MAIN X 511890)]F3 X [[ZPPM X (MAIN X 140471)]F3]]OPF2 X [ZPPM339 X [511890 X 482399]F3]F2]F2 X [ZCPM339 X [ZPPM X [[ZPPM339 X (MAIN X 511890)]F3]]F2]F3]F3. The term "composite," as used to describe this breeding line, means that the seeds comprising ATCC Accession No. PTA-3860, while genetically uniform, were collected from the following three plants: (i) NY 01-190-**3R**; (ii) NY 01-190-**7L**; and (iii) NY 01-190-**9L** (emphasis added to show the differences). The last two digits of each plant number designates the location of the individual plant within the field row in which "NY 01-190" was planted.

13. I am familiar with the following references: (i) Prasad et al., "Inheritance of Resistance to *Mycosphaerella citrullina* in Muskmelon," J. Amer. Soc. Hort. Sci. 91:396-400 (1967) ("Prasad"); (ii) Norton et al., "AC-70-154, A Gummy Stem Blight-Resistant Muskmelon Breeding Line," HortScience 24(4):709-711 (1989) ("Norton"); (iii) Kalb et al., "Evaluation of Combining Ability, Heterosis, and Genetic Variance for Fruit Quality Characteristics in Bush Muskmelon," J. Amer. Soc. Hort. Sci. 109(3):411-415 (1984) ("Kalb"); (iv) Zhang et al., "Screening Melon (*Cucumis melo*) for Resistance to Gummy Stem Blight in the Greenhouse and Field," HortScience 32(1):117-121 (1997) ("Zhang"); and (v) Trulson et al., "*In vitro* Plant

Regeneration in the Genus *Cucumis*," Plant Science 47:35-43 (1986) ("Trulson"). The methods described in my present application, the gummy stem blight resistant *Cucumis melo* hybrid seeds and plants produced by these methods, and the NY 01-190-3R,-7L-9L (composite) breeding line are not described in any of these references. In particular, nowhere does Prasad, Norton, Kalb, Zhang, or Trulson, alone or in combination, teach crossing the recurrent and non-recurrent parent plants described in my present application in order to yield the gummy stem blight resistant *Cucumis melo* hybrid seeds or plants of my present application. As described in paragraph 12 (above), this is true for the NY 01-190-3R,-7L,-9L (composite) breeding line, which was derived from recurrent and non-recurrent parent plants that are different from those of the above cited references. Further, the level of gummy stem blight resistance demonstrated in the NY 01-190-3R,-7L,-9L (composite) breeding line is significantly higher than any of the plants described in the above cited references.

14. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that any such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 8 July 04

Margaret M. Jahn

Margaret M. Jahn

PI 157082

Cucumis melo subsp. melo CUCURBITACEAE

Cultivar name: Pin-ko-chin.
Maintained by the North Central Regional PI Station. NPGS received: Dec-1946. Inventory volume: 154. Accession backed up at second site.

Accession names and identifiers

Pin-ko-chin
Type: CULTIVAR.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Source History

- Type: Donated. Date: 27-Dec-1946. From: Maryland, United States.
  Cooperators:
  1. Crane, H., Bureau of Plant Industry, Soils, and Agricultural Engineerig.

- Type: Collected. Date: PRE 27-Dec-1946. From: China.
  Cooperators:
  1. Crane, H., Bureau of Plant Industry, Soils, and Agricultural Engineerig.

Observations

| USDA | ARS | GRIN | NPGS | New Search |

PI 511890

Cucumis melo subsp. melo CUCURBITACEAE

Collector identifier: 851125-02.
Maintained by the North Central Regional PI Station. NPGS received: 15-Apr-1987. Inventory volume: 196. Improvement status: Wild material. Form received: Seed. Accession backed up at second site.

Accession names and identifiers

851125-02
Type: COLLECTOR. Group: IBPGR. Comment: International Board for Plant Genetic Resources.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Narrative

Seeds germinate with rains, harvest September/October. Originally received as C. melo var. dudaim.

Annotations

Action	Date	Site	Old Name
Nom-Change	07-May-1992	SBML	Cucumis melo var. dudaim

Source History

- Type: Collected. Date: 25-Nov-1985. From: Sinaloa, Mexico.
  Locality: Growing on level site in hilly region in sandy soil, roadside ditch next to Sorghum field, near Guamuchil, 8km W on road to Mocorito, Rio Mocorito region, Sinaloa. Latitude: 25 deg. 25 min. North (25.417), Longitude: 108 deg. 00 min. West (-108.000) Map it. Elevation: 50 meters

- Type: Donated. Date: 15-Apr-1987. From: California, United States.
  Cooperators:
  1. Merrick, L., University of California-Davis.

  Comment: Received through IBPGR, Rome, Italy..

Observations

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

PI 482398

Cucumis melo subsp. melo CUCURBITACEAE

Collector identifier: TGR 185.
Maintained by the North Central Regional PI Station. NPGS received: Jan-1983. Inventory volume: 191.
Improvement status: Cultivated material. Form received: Seed. Accession backed up at second site.

Accession names and identifiers

TGR 185
Type: COLLECTOR. Comment: Gwarazimba et al. V.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Narrative

Sown October, harvested April. Fruits small, green. Flesh bitter, yellow. Leaves eaten as herbs.

Source History

- Type: Collected. Date: 19-Apr-1982. From: Zimbabwe.
  Locality: Farmland, 27 km S of Dombodema, near Kyle Dam Wall, Victoria Province. Latitude: 20 deg. 25 min. 00 sec. South (-20.417), Longitude: 031 deg. 03 min. 00 sec. East (31.050) Map it. Elevation: 800 meters
  Cooperators:
  1. Gwarazimba, V., Crop Breeding Institute.
  2. Toll, J., IBPGR.

- Type: Donated. Date: Jan-1983. From: Zimbabwe.
  Cooperators:
  1. Gwarazimba, V., Crop Breeding Institute.
  2. Toll, J., IBPGR.
  Comment: Received through International Board for Plant Genetic Resources (IBPGR), Rome, Italy.

Observations

Cite as: USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)*. [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland. Available: http://www.ars-grin.gov/cgi-bin/npgs/html/acchtml.pl?1377334 (06 July 2004)

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

PI 482399

Cucumis melo subsp. melo CUCURBITACEAE

Collector identifier: TGR 228.
Maintained by the North Central Regional PI Station. NPGS received: Jan-1983. Inventory volume: 191.
Improvement status: Cultivated material. Form received: Seed. Accession backed up at second site.

Accession names and identifiers

TGR 228
Type: COLLECTOR. Comment: Gwarazimba et al. V.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Narrative

Sown November. Flesh bitter, cooked. Leaves eaten.

Source History

- Type: Collected. Date: 21-Apr-1982. From: Zimbabwe.
  Locality: Farmland, 20 km S of Sabi Bridge. Chiredze District, Victoria Province. Latitude: 21 deg. 07 min. 00 sec. South (-21.117), Longitude: 032 deg. 08 min. 00 sec. East (32.133) Map it.
  Elevation: 350 meters
  Cooperators:
  1. Gwarazimba, V., Crop Breeding Institute.
  2. Toll, J., IBPGR.

- Type: Donated. Date: Jan-1983. From: Zimbabwe.
  Cooperators:
  1. Gwarazimba, V., Crop Breeding Institute.
  2. Toll, J., IBPGR.
  Comment: Received through International Board for Plant Genetic Resources (IBPGR), Rome, Italy.

Observations

| USDA | ARS | GRIN | NPGS | New Search |

Cite as: USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)*. [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland. Available: http://www.ars-grin.gov/cgi-bin/npgs/html/acchtml.pl?1377335 (06 July 2004)

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

PI 140471

Cucumis melo subsp. melo CUCURBITACEAE

Cultivar name: SMELL.
Maintained by the North Central Regional PI Station. NPGS received: 21-Mar-1941. Inventory volume: 146. Accession backed up at second site.

Accession names and identifiers

SMELL
Type: CULTIVAR.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Narrative

Fruit small, orange yellow, somewhat striped while still green.

Source History

- Type: Donated. Date: 21-Mar-1941. From: Texas, United States.
  Cooperators:
  1. Godfrey, G., Agricultural Experiment Station.

Observations

Ordering Germplasm

Please direct requests for germplasm or information to:

USDA-ARS North Central Regional Plant Introduction Station
G-212 Agronomy Hall
Iowa State University
Ames, IA 50011-1170
Phone: (515) 294-2250
Fax: (515) 294-1903
Request via Email: nc7orders@iastate.edu

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Monogenic Dominant Resistance to Gummy Stem Blight in Two Melon (*Cucumis melo*) Accessions

T. L. Zuniga, Graduate Research Assistant, Department of Plant Pathology, **J. P. Jantz,** Research Support Specialist, Department of Plant Breeding, **T. A. Zitter,** Professor, Department of Plant Pathology, and **M. K. Jahn,** Associate Professor, Department of Plant Breeding, Cornell University, Ithaca, NY 14853

ABSTRACT

Zuniga, T. L., Jantz, J. P., Zitter, T. A., and Jahn, M. K. 1999. Monogenic dominant resistance to gummy stem blight in two melon (*Cucumis melo*) accessions. Plant Dis. 83:1105-1107.

Two melon (*Cucumis melo* L.) accessions, plant introduction (PI) 157082 and PI 511890, reported to be resistant to gummy stem blight, a disease incited by the fungus *Didymella bryoniae*, were crossed with a susceptible parent to determine the inheritance of resistance. Resistance in both accessions is due to a single dominant gene, based on analysis of F_1, F_2, and backcross populations. Additionally, PI 157082 was crossed with PI 140471, the other source of resistance identified to date, to examine the genetic relationship of resistance found in these two sources. The frequency of susceptible individuals from the (PI 157082 × 140471) F_2 population was consistent with a 15:1 resistant:susceptible ratio, indicating that PIs 140471 and 157082 possess different resistance genes.

Additional keywords: cucurbits, disease resistance

Gummy stem blight (GSB) of cucurbits is incited by the fungus *Didymella bryoniae* (Auersw.) Rehm (synonyms: *Mycosphaerella citrullina* (C. O. Sm.) Gross. and *M. melonis* (Pass.) Chiu & J. C. Walker) and its anamorph *Phoma cucurbitacearum* (Fr.:Fr.) Sacc. (synonyms: *Ascochyta cucumis* Fautrey & Roum. and *A. citrullina* (F. Chester) C. O. Sm.) (13). The disease is most common in tropical and sub-tropical areas of the world, but it is also a serious disease of cucurbits in the United States (15). In the southeastern states, GSB is the most destructive disease of watermelon (*Citrullus lanatus*) and cucumber (*Cucumis sativus*), (1,18) and also causes serious losses on melon (*C. melo*). The disease has increased in importance in recent years as effective chemical and genetic control of other cucurbit diseases has become available (14).

Symptoms of GSB include circular, tan to dark-brown spots on leaves that may enlarge under favorable conditions to cover the leaf. On cotyledons and stems of young plants, circular black or tan lesions may be evident. Water-soaked areas may develop on hypocotyls and leaves. Cankers may appear in stem cortical tissue that produce a typical brown, gummy exudate and may girdle the stem, resulting in plant death (14).

Control practices include the use of fungicide-treated seed and a minimum 2-year crop rotation (15). Although satisfactory chemical control can be achieved with fungicides (1), resistance to benzimidazole products has been reported (2,4,5,15). Several sources of GSB resistance in wild *C. melo* accessions from the United States Department of Agriculture (USDA) National Plant Germplasm System (NPGS) have been previously reported (6,16,17,20). A recent study that employed both greenhouse and field evaluations yielded several new sources of resistance to GSB among the 800 accessions examined. Levels of resistance identified in this study were equal to or greater than any previously reported (20). Although genetic resistance was identified in *C. melo* in the 1960s and efforts to incorporate resistance into cultivated melon have been ongoing (7–10), no commercial varieties with adequate levels of resistance are currently available (15). Thus, there is still a need to incorporate higher levels of genetic resistance in melon varieties.

The first objective of this study was to determine the mode of inheritance of GSB resistance found in two highly resistant *C. melo* plant introductions (PI), USDA PIs 157082 and 511890, identified by Zhang et al. (20). The second objective was to determine the genetic relationship between these sources of resistance and PI 140471, a wild melon previously described as having GSB resistance (17) controlled by a single dominant gene (12). Due to problems with producing seed of the necessary crosses with PI 511890, only the relationship between PI 157082 and PI 140471 was determined in this study.

MATERIALS AND METHODS

Germ plasm and population development. *C. melo* PI 157082 and PI 511890 obtained from the USDA NPGS at Ames, Iowa were crossed with a susceptible genotype, 'Cornell ZPPM 339', with each other, and with PI 140471, to determine the mode of inheritance of GSB resistance. Cv. Cornell ZPPM 339 is a cantaloupe breeding line, well-adapted to greenhouse and field conditions, and monoecious, which eliminates the need for emasculation when used as a female parent. Controlled pollinations were carried out in the field and greenhouse to generate reciprocal F_1, F_2, and backcross (BC) progenies. Due to poor adaptation of PI 511890 to conditions in Ithaca, New York and extreme susceptibility to powdery mildew, we were unable to produce adequate seed for testing from PI 157082 × PI 511890 and reciprocal crosses and PI 511890 × PI 140471 and reciprocal crosses in either the greenhouse or the field. To confirm previously published results regarding genetics of resistance for PI 140471, we also crossed PI 140471 with the cv. Mainstream, released by the United States Vegetable Laboratory in Charleston, South Carolina (11) and developed reciprocal F_1, F_2, and BC progenies. Cv. Mainstream was bred under unprotected conditions in South Carolina, and some tolerance to the disease is observed under some field conditions, but it is rated susceptible in inoculated tests (20).

For field plantings in Ithaca, New York, 4-week-old seedlings from the greenhouse were acclimated for 3 days in cold frames outside the greenhouse before transplanting to beds covered with black plastic mulch. Plots consisted of 12 plants, with 2 plants per hill. Rows were spaced 2.1 m apart and hills were 0.6 m apart within the rows. Prior to transplanting, field plots were plowed and disked once, then broadcast fertilized with 225 Kg of 10-20-20 fertilizer. At transplant, approximately 500 ml

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of a starter fertilizer (9-45-15) was applied at a rate of 7 g/liter for each hill.

Resistance evaluations. To assure uniform stands for resistance evaluations, seeds were germinated on paper towels held at 28°C for 48 h, and seedlings were transplanted to Todd planter flats (4 by 8 cells; Hummert International, Earth City, MO) filled with Peatlite mix (1:1 peat moss:vermiculite). Two susceptible control plants each of 'Top Mark' and 'Honeydew Greenflesh' were planted randomly in each flat to monitor inoculation efficacy and test severity. Seedlings were held in a greenhouse at 24°C. All evaluations for genetic studies were carried out in the greenhouse essentially as described by Zhang et al. (20) using NY1, a highly virulent *D. bryoniae* isolate collected in the field in Onondaga, New York (3).

Data collection and analyses. Disease severity on stems of individual plants was recorded using a modified version of the procedure by Zhang et al. (20). Instead of a single reading at 7 days after inoculation, a second reading was also made at 21 days after inoculation. A 1 to 5 scale was used where 1 = no damage; 2 = a single lesion 1 to 10 mm long or coalesced lesions 1 to 20 mm, no girdling; 3 = lesions 21 to 80 mm, girdling of the stem, or both; 4 = withered stem; and 5 = dead seedling (19). The numbers of individuals falling into resistant and susceptible classes were tallied, and observed segregation ratios in F_2 and BC populations were tested for goodness-of-fit using the chi-square statistic.

RESULTS

Parental reactions. Disease scores for parental lines inoculated with the GSB pathogen are summarized in Table 1. There was a clear and consistent difference in stem disease ratings at 21 days after inoculation between the resistant and susceptible parents in all tests. This defined the categories which were then used to group individuals from segregating populations. All plants of the resistant parents showed disease scores of 1 or 2. Almost all (96%) plants of PI 140471, 75% of PI 157082, and 70% of PI 511890 had scores of 1. The susceptible parent ZPPM 339 showed only disease scores between 3 and 5 (Table 1); 97% of these seedlings had either withered stems or were dead (scores of 4 and 5).

Inheritance of resistance in PI 157082. The reciprocal F_1 progenies between PI 157082 and ZPPM 339 showed uniformly high resistance, indistinguishable from the resistant parent, and consistent with dominant inheritance with no cytoplasmic (maternal) factors involved. The F_2 population segregated consistent with a 3:1 resistant:susceptible ratio (Table 2), supporting the hypothesis that resistance in this PI is controlled by a single dominant gene. Plants from the BC population derived from the resistant parent were uniformly resistant, and the BC derived from the susceptible parent segregated consistent with a 1:1 resistant:susceptible ratio (Table 2), which further supports monogenic dominant inheritance of gummy stem blight resistance from PI 157082.

Relationship of dominant resistance from PI 157082 to the *Mc* gene from PI 140471. To determine whether the dominant resistance allele in PI 157082 is related to the *Mc* locus previously identified by Prasad and Norton (12), PI 157082 was crossed with PI 140471. We first confirmed that PI 140471 indeed carries a single dominant gene by producing and screening F_1, F_2, and resistant and susceptible BC progenies with *C. melo* cv. Mainstream (*data not shown*). All plants from the F_1 population obtained by crossing PI 140471 and PI 157082 were uniformly highly resistant, with disease scores of 1 (Table 2). The F_2 plants segregated consistent with a 15:1 resistant:susceptible ratio (Table 2), supporting the hypothesis that GSB resistance in PI 157082 is controlled by a resistance allele at a locus that is unlinked to the *Mc* locus. Moreover, most of the plants in the susceptible category were dead (60%) or had severe stem infections (26%), while the majority (67%) of the resistant F_2 plants had scores of 1.

Inheritance of resistance in PI 511890. Reciprocal F_1 populations of PI 511890 and ZPPM 339 were highly resistant and their reactions did not differ, suggesting that GSB resistance from this source is also dominant, and that no cytoplasmic (maternal) factors are involved in its expression. F_2 plants segregated consistent with a 3:1 resistant:susceptible ratio (Table 2), indicating this source also possesses monogenic dominant resistance to GSB. As expected under this hypothesis, plants from the resistant BC were uniformly resistant, while those from the susceptible BC segregated consistent with a 1:1 resistant:susceptible ratio (Table 2).

DISCUSSION

Previously, a single dominant gene (*Mc*) in PI 140471 was reported (12) and has been used in the development of several varieties and breeding lines (7–10). In a recent study, however, releases originating from PI 140471 showed intermediate resistance or were rated as susceptible in greenhouse and field screens (20). Zhang et al. (20) suggested that this failure to recover parental levels of resistance in cultivated breeding types might be the result of interactions of the *Mc* gene with different genetic backgrounds. Alternatively, the resistance conferred by this gene may not be sufficiently high to protect vines that are under extreme physiological stress due to the concentrated set of large fruit (20).

Results from our genetic studies, using a different susceptible parent and a very reliable, severe screening method, confirmed the previous report of a single gene conferring resistance to GSB in PI 140471 (*data not shown*). Similarly, GSB resistance in PIs 157082 and 511890 also appears to be controlled by a single dominant

Table 1. Stem disease severity scores for melon genotypes used as parents in this study 21 days after inoculation with *Didymella bryoniae*

Parents	Disease index[a]	Rating
ZPPM 339	4.3 (± 0.51)	Susceptible
PI 140471	1.1 (± 0.20)	Resistant
PI 157082	1.3 (± 0.57)	Resistant
PI 511890	1.3 (± 0.47)	Resistant

[a] Mean ± standard deviation of severity scores based on a 1 to 5 scale (1 = no damage; 2 = a single lesion 1 to 10 mm long or coalesced lesions 1 to 20 mm, no girdling; 3 = lesion 21 to 80 mm, girdling of the stem, or both; 4 = withered stem; and 5 = dead seedling).

Table 2. Response of *Cucumis melo* parental genotypes and intercrossed populations to inoculation with *Didymella bryoniae*

		Number of plants[a]			
Pedigree[b]	Generation[c]	R	S	Expected ratio (R:S)	$P_{\alpha=0.05}$
ZM	P	1	30	0:1	...
471	P	24	0	1:0	...
082	P	20	0	1:0	...
890	P	26	0	1:0	...
082 × ZM	F_1	31	4	1:0	...
ZM × 082	F_1	14	2	1:0	...
082 × ZM	F_2	84	21	3:1	0.31
(082 × ZM) × ZM	BC_s	36	35	1:1	0.92
(082 × ZM) × 082	BC_r	65	0	1:0	...
890 × ZM	F_1	17	1	1:0	...
ZM × 890	F_1	46	1	1:0	...
890 × ZM	F_2	63	27	3:1	0.14
(890 × ZM) × ZM	BC_s	40	27	1:1	0.15
(890 × ZM) × 890	BC_r	54	0	1:0	...
471 × 082	F_1	8	0	1:0	...
471 × 082	F_2	234	23	15:1	0.13

[a] R = resistant, S = susceptible.
[b] ZM = ZPPM 339; 471 = PI 140471; 082 = PI 157082; and 890 = PI 511890.
[c] P = parent; BC_r and BC_s = backcross to resistant and susceptible parents, respectively.

gene but, due to lack of availability of the necessary populations, we were unable to establish whether these two PIs share the same gene for resistance or contain two distinct resistance genes.

We were, however, able to generate the necessary populations to determine the relationship between the *Mc* locus in PI 140471 and the resistance gene from PI 157082. Our results clearly establish that these two accessions contain distinct resistance genes at unlinked loci. Preliminary results from our breeding program indicate that the combination of these two genes may yield higher levels of resistance than either gene alone (J. P. Jantz and M. K. Jahn, *unpublished results*).

We have not conducted a survey of *D. bryoniae* isolates on these two new sources of resistance, so we do not know if these genetic resources differ from PI 140471 with regard to fungal isolate specificity. We do know from previous research (3) and from additional studies (T. L. Zuniga and T. A. Zitter, *unpublished results*) that race-specificity does not exist in cucurbit species including cucumber (19), although one previous report indicated that in melon resistance from PI 140471 may not be consistently expressed in the field (16). When combined in a single genotype, diverse sources of resistance may increase both the level of resistance and the breadth of protection, augmenting chemical disease control approaches which are currently judged inadequate (1,4), especially when environmental conditions are conducive to disease development (1).

ACKNOWLEDGMENTS

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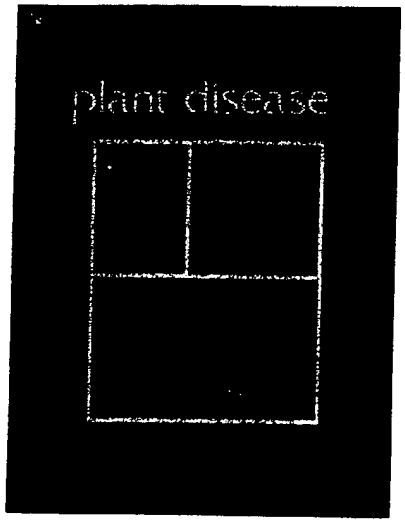
LITERATURE CITED

1. Keinath, A. P. 1995. Fungicide timing for optimum management of gummy stem blight epidemics on watermelon. Plant Dis. 79:354-358.
2. Keinath, A. P., Cook, W. P., and DuBose, V. 1992. Control of gummy stem blight in watermelon with fungicides, 1991. Fungic. Nematic. Tests 47:156.
3. Keinath, A. P., Farnham, M. W., and Zitter, T. A. 1995. Morphological, pathological, and genetic differentiation of *Didymella bryoniae* and *Phoma* spp. isolated from cucurbits. Phytopathology 85:364-369.
4. Keinath, A. P., and Zitter, T. A. 1995. First report of benomyl-insensitive *Didymella bryoniae* in the United States. (Abstr.) Phytopathology 85:1126.
5. Keinath, A. P., and Zitter, T. A. 1998. Resistance to benomyl and thiophanate-methyl in *Didymella bryoniae* from South Carolina and New York. Plant Dis. 82:479-484.
6. McGrath, D. J., Vawdrey, L., and Walker, I. O. 1993. Resistance to gummy stem blight in muskmelon. HortScience 28:930-931.
7. Norton, J. D. 1971. Gulfcoast—A sweet cantaloupe for the produce chain store market. Ala. Agric. Exp. Stn. Leafl. 82.
8. Norton, J. D. 1972. Chilton, a high quality fruit for the commercial market. Ala. Agric. Exp. Stn. Leafl. 84.
9. Norton, J. D., and Cosper, R. D. 1989. Ac-70-154 a gummy stem blight-resistant muskmelon breeding line. HortScience 24:709-711.
10. Norton, J. D., Cosper, R. D., Smith, D. A., and Rymal, K. S. 1985. Aurora—a high quality disease resistant cantaloupe. Ala. Agric. Exp. Stn. Circ. 278.
11. Nugent, P. E., Hoffman, J. C., and Andrus, C. F. 1979. 'Mainstream' melon. HortScience 14:192.
12. Prasad, K., and Norton, J. D. 1967. Inheritance of resistance to *Mycosphaerella citrullina* in muskmelon. J. Amer. Soc. Hortic. Sci. 91:396-400.
13. Sherf, A. F., and MacNab, A. A. 1986. Pages 340-346 in: Vegetable Diseases and Their Control. Wiley-Interscience, New York.
14. Sitterly, W. R. 1972. Breeding for disease resistance in cucurbits. Annu. Rev. Phytopathol. 10:471-490.
15. Sitterly, R. W., and Keinath, A. P. 1996. Gummy stem blight. Pages 27-28 in: Compendium of Cucurbit Diseases. T. A. Zitter, D. L. Hopkins, and C. Thomas, eds. APS Press, St. Paul, MN.
16. Sowell, G., Jr. 1981. Additional sources of resistance to gummy stem blight of muskmelon. Plant Dis. 65:253-254.
17. Sowell, G., Jr., Prasad, K., and Norton, J. D. 1966. Resistance of *Cucumis melo* introductions to *Mycosphaerella citrullina*. Plant Dis. Rep. 50:661-663.
18. St. Amand, P. C., and Wehner, T. C. 1991. Crop loss to 14 diseases of cucumber in North Carolina from 1983 to 1988. Cucurbit Genet. Coop. Rep. 14:15-17.
19. St. Amand, P. C., and Wehner, T. C. 1995. Eight isolates of *Didymella bryoniae* from geographically diverse areas exhibit variation in virulence but no isolate by cultivar interaction on *Cucumis sativus*. Plant Dis. 79:1136-1139.
20. Zhang, Y., Kyle, M., Anagnostou, K., and Zitter, T. A. 1997. Screening melon (*Cucumis melo*) for resistance to gummy stem blight in the greenhouse and field. HortScience 32:117-121.



COVER

(*Clockwise from upper left*): False smut of corn caused by *Ustilaginea virens* (courtesy F. Elango); root and crown rot of bell pepper caused by *Phytophthora capsici* (courtesy J. B. Ristaino and S. A. Johnston, see page 1080); powdery mildew of *Parthenium hysterophorus* caused by *Oidium parthenii* (courtesy P. Sreerama Kumar).

The American Phytopathological Society
3340 Pilot Knob Road
St. Paul, MN 55121-2097
(651)454-7250

* Interpretive summary is available in the on-line version of PLANT DISEASE at http://www.scisoc.org

plant disease

AN INTERNATIONAL JOURNAL OF APPLIED PLANT PATHOLOGY

An Official Journal of The American Phytopathological Society

December 1999 **Volume 83, Number 12**

FOCUS

FEATURE

RESEARCH

Query Results for:

Search string: tam uvalde
Restricted to active and available accessions
Limit to first 1000 records

NSL 92623

Cucumis melo subsp. melo CUCURBITACEAE

Unverified name: TAM-UVALDE.
Maintained by the National Center for Genetic Resources Preservation. NPGS received: 1979. Form received: Seed.

Accession names and identifiers

TAM-UVALDE
Type: UNVERIFIED.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Source History

- Type: Donated. Date: 1979. From: Texas, United States.
  Cooperators:
  1. Texas A&M University.

Cite as: USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)*. [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland. Available: http://www.ars-grin.gov/cgi-bin/npgs/html/acc_search.pl?accid=tam+uvalde (06 July 2004)

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

National Center for Genetic Resources Preservation

USDA, ARS, NCGRP
National Center for Genetic Resources Preservation
1111 South Mason Street
Fort Collins, Colorado 80521-4500

Phone: (970) 495-3200
FAX: 970-221-1427

E-mail: nssl@ars-grin.gov

Repository Home Page

Curator:

Loren Wiesner (Base Collection) nssllw@ars-grin.gov

Species held at site

| USDA | ARS | GRIN | NPGS | New Search |

Cite as: USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)*. [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland. Available: http://www.ars-grin.gov/cgi-bin/npgs/html/site.pl?NSSL (06 July 2004)

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

Query Results for:

Search string: topmark
Restricted to active and available accessions
Limit to first 1000 records

NSL 30032

Cucumis melo subsp. melo CUCURBITACEAE

Unverified name: Top Mark.
Maintained by the North Central Regional PI Station. NPGS received: Feb-1964. Life form: Annual.
Form received: Seed. Accession backed up at second site.

Accession names and identifiers

Top Mark
Type: UNVERIFIED.

Availability

Material is available for distribution. The normal amount distributed is 50 seeds.

Source History

- Type: Donated. Date: Feb-1964. From: California, United States.
  Cooperators:
  1. Dessert Seed Co.,Inc.

Observations

North Central Regional PI Station

USDA, ARS, NCRPIS
Iowa State University
Regional Plant Introduction Station
Ames, Iowa 50011-1170

Phone: (515)294-3255
FAX: (515)294-4880

E-mail: nc7@ars-grin.gov

Repository Home Page

Curators:

David Brenner (Pseudocereals, Grasses, Forage Legumes & Spinach) dbrenner@iastate.edu
Laura Marek (Oil Seed Brassicas, Flax and Sunflower) lmarek@iastate.edu
Joe-Ann McCoy (Medicinal Plants) joemccoy@iastate.edu
Mark J. Millard (Maize) nc7mm@ars-grin.gov
Kathleen Reitsma (Vegetable Crops) kreitsma@iastate.edu
Robert A. Stebbins (Seed requests for Cuphea and Euphorbia) stebbins@iastate.edu
Mark P. Widrlechner (Ornamental Crops) isumw@iastate.edu

Crops evaluated
Species held at site

Cite as: USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)*. [Online Database] National Germplasm Resources Laboratory, Beltsville, Maryland. Available: http://www.ars-grin.gov/cgi-bin/npgs/html/site.pl?NC7 (06 July 2004)

Please send comments to the Database Management Unit at: dbmu@ars-grin.gov

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Hollar Premium Varieties

About Premium Varieties & Premium Distributors
| Watermelon | Melon | Summer Squash | Pumpkin | Winter Squash | Cucumber |

Watermelons
Anthem F1
Arriba! F1
AU-Producer P.V.P.
Bravo F1
Calsweet
Carmen F1
Carson F1
Crimson Delight F1
Matador F1
Ruby F1
Vista F1
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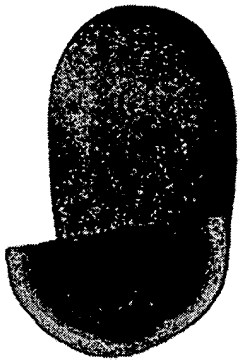
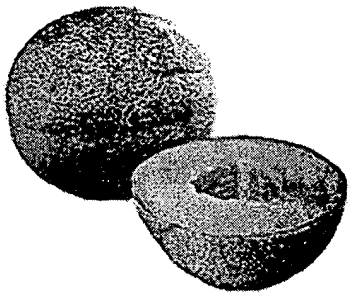
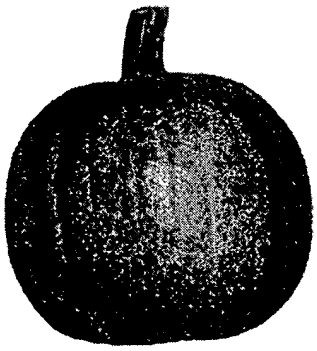




Melons
Duke F1
Earligold F1
Earliqueen F1
Gourmet F1
Otero F1
Passport F1
Sonora F1
Sweet Delight **PVP**
Return to Top

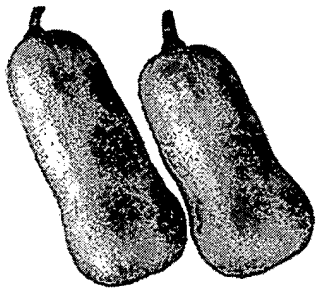
Summer Squash
BonitaF1
Cancun F1
Eight Ball F1
Horn of Plenty F1
Sebring F1
Return to Top



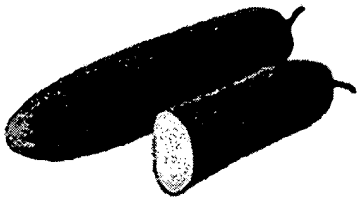
Pumpkins
Aspen F1
Full Moon
Jack Be Little
Jack of All Trades F1
Lumina
Neon F1
Return to Top

Winter Squash
Avalon F1(Butternut)

Mesa Queen F1
Small Wonder F1
Stripetti F1
Ultra HP F1
Waltham
Zenith F1
Return to Top



Click Here for Butternut type comparison trials.



Cucumbers
Marketmore 76
Olympian
Return to Top

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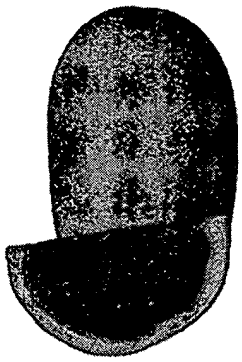
| Watermelon | Melon | Summer Squash | Winter Squash | Pumpkin | Cucumber | Gourd |

- **All seed is produced from Hollar stockseed.**
- **Hollar name on all our production for 50 years.**
- **Germination testing within ISTA standards.**

Watermelon

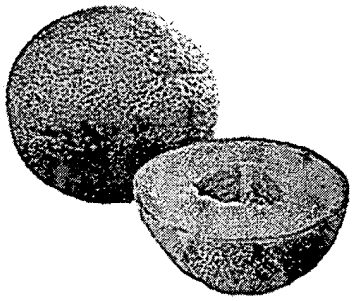
Allsweet	Anthem F1
Arriba! F1	AU-Producer P.V.P.
Bravo F1	Calsweet
Carmen F1	Charleston Grey #5
Charleston Gray No. 133	Crimson Delight F1
Crimson Sweet	Greystone F1
King & Queen (Winter)	Mickylee PVP
Matador F1	Ruby F1
Seville F1	Sugar Baby
Vista F1	(Return to Top)



Melon

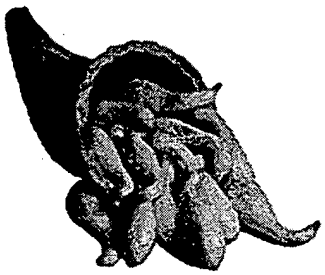
Ananas	Banana
Delicious 51	Earligold F1
Earliqueen F1	Gourmet F1

Hale's Best Jumbo	Otero F1
Passport F1	Planter's Jumbo
Rocky Ford Green Flesh	Rocky Sweet F1
Sweet Delight PVP	(Return to Top)



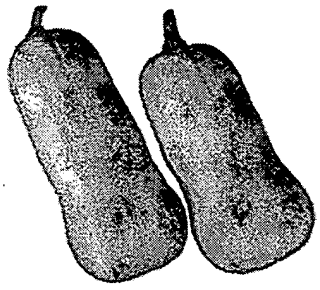
Summer Squash

Black Beauty	Crookneck, Early Summer Yellow
Eight Ball F1	Grey Zucchini
Horn of Plenty F1	Jackpot F1
Round Zucchini	Saffron
Straightneck, Early Prolific	Scallop Early White Bush
Sebring F1	(Return to Top)



Winter Squash

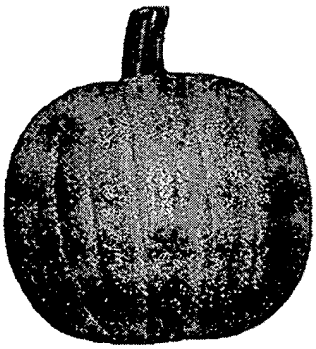
Avalon F1	Banana Pink Jumbo
Buttercup Burgess	Hubbard Blue
Hubbard Blue New England	Mesa Queen F1
Small Wonder F1	Stripetti F1
Table Queen Acorn	Turks Turban
Ultra F1	Ultra HP F1
Vegetable Spaghetti (New Strain)	Waltham
Zenith F1	(Return to Top)



Click here for Butternut type comparison trials.

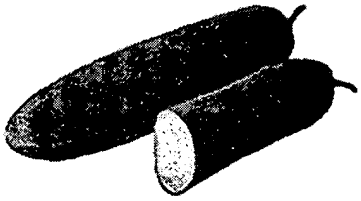
Pumpkin

Aspen F1	Big Max
Connecticut Field	Cushaw Green Striped
Full Moon (PVP Applied for)	Halloween/Jack O'Lantern
Howden	Jack Be Little
Jack of All Trades F1	Little October (PVP Applied for)
Lumina PVP	Neon F1
Small Sugar/New England Pie	(Return to Top)



Cucumber

	Armenian Yard Long
Catalina F1	Marketmore 76
Marketmore 86	Mekty Green
Mekty White	National Pickle
Olympian F1	Poinsett 76
SMR 58	Spacemaster 80
Straight Eight	Straight Nine



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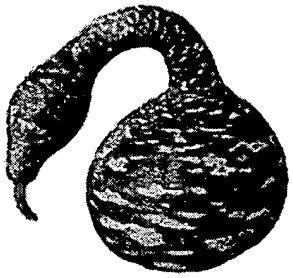
Gourd

Bottle, Large	Calabash
Corsican	Crown of Thorns
Dipper, Long Handled	Goblin eggs
Mixed, Large Types	Mixed, Large & Small
Mixed, Small Ornamental	Nest Egg
Pear Bi-Colored	Shenot Crown of Thorns
Small Flat Striped	
Small Orange	Small Spoon
Small Warted Professional	Speckled Swan
Turk's Turban	



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Passport F1

Galia type melon, but EARLY to mature! This green fleshed melon has been the star performer in our test gardens for years. Passport F1 is ready to eat in only 70 days, the crownset fruit weigh up to 7 pounds (3.2 kg) when grown outdoors in summer. The size will be much less when grown in cool temperature. We recommend this for your earliest planting, where earliness means a higher price.

HOLLAR PREMIUM

Click to return.

Rocky Sweet F1

A Galia melon at an attractive price. Rocky Sweet F1 matures in about 82 days, has green flesh and is netted. Rind is yellow/green to golden in color.

HOLLAR PREMIUM

Click to return.

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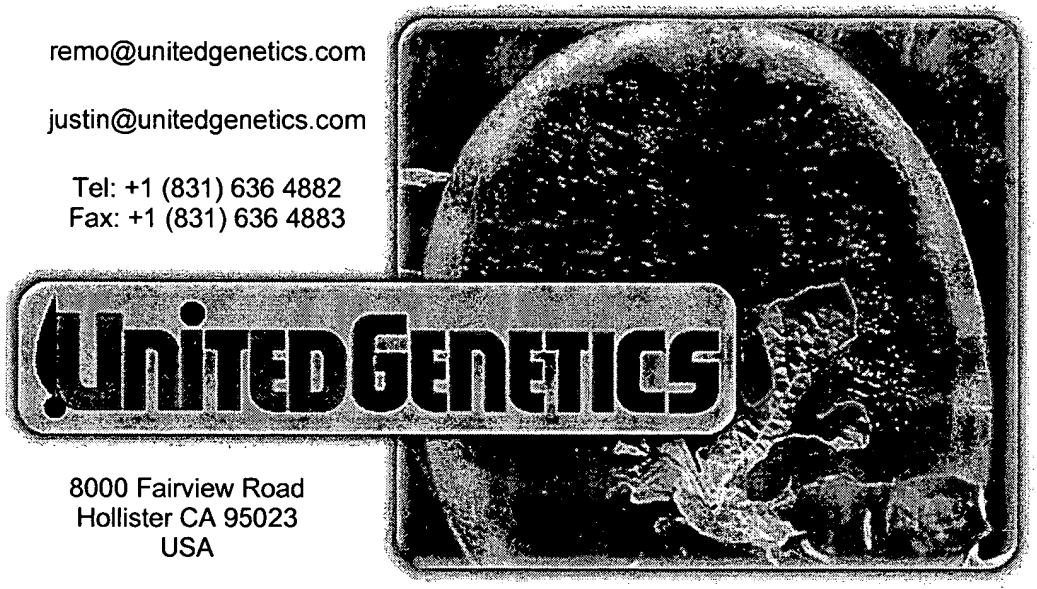

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the major vegetable growing areas of the world.

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Venezuela

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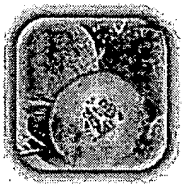
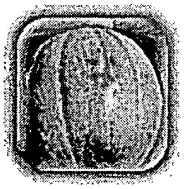
Saudi Arabia
Syria
Yemen

North America
United States

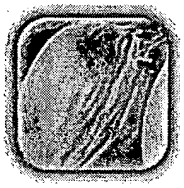
- Cucumber
- Melon
- Onion
- Pepper
  - sweet
  - hot
- Radicchio
- Squash
- Tomato
  - fresh market
  - processing
- Watermelon

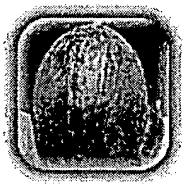


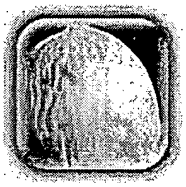
- Ananas
- Cantaloupe
- Galia
- Honey Dew
- Piel de Sapo
- Rochet
- Rucozo di Cosenza
- Yellow Canaria

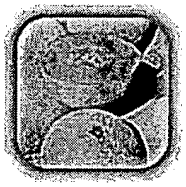


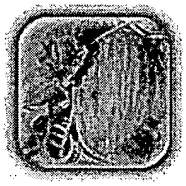
Variety descriptions ▶▶▶











VARIETY	MATURITY	FRUIT WEIGHT	BRIX	FLESH COLOR	RESISTANCE TO TRANSPORT	DISEASE RESISTANCE TOLERANCE
Cantaloupe						
Hybrid Tornado F1	mid early	1 kg	10°	salmon	****	F 0-2 PMR 1-2, Sulfur
	Slightly oval in shape, full net, Western type, earlier than Hiline and Durango. Tornado F1 will perform in any extreme growing conditions and will give crop security to the growers.					
Hybrid Cruzado F1	early	1.1 kg	11°	salmon	****	F 0-2 PMR 1-2, Sulfur
	Like Tornado F1, this full netted Western melon has a slightly oval shape and small cavity. It has been introduced to compete against Cruiser. Its disease resistance is making Cruzado F1 a winner.					
Hybrid Coronado F1	mid early	1.2 kg	11.5°	deep samlon	****	F 0-2 PMR 1-2, Sulfur
	Hybrid Coronado F1 is a rare combination of quality and disease resistance. This hybrid is a round full net, large size, small cavity melon and it has the highest internal quality. Coronado F1 has been declared a leading variety after its introduction to the market.					
Hybrid Primato F1	early	1.2 kg	11.5°	deep salmon	****	PMR 1-2, Sulfur
	The best quality available in early melon. Round shape, large size, full net and small cavity make it the direct competition against Laguna and Primo. Primato is the hybrid that should be grown as the early melon in all the winter growing areas.					
Hybrid Don Diego F1	83 days	1.0 kg	12°	deep salmon	****	F 0-2 PMR 1-2, Sulfur
	A mid early full net Western shipper type with a ropey net, fantastic vine cover, and high productivity. Don Diego F1 tested well in Arizona and California's Central Valley, showing exceptional internal quality, with sizes ranging from 12s to 19s.					
Hybrid Torreon F1	85 days	1.5 kg	12°	salmon	****	PMR 1-2, Sulfur
	Torreon F1 is a full-netted, deep round Western shipper melon with a small cavity and fantastic internal color. Its vigorous vine provides good cover and great yields. Exceptionally suited for high quality markets and widely adapted in many regions and climates, especially in Central America. Sizes range from 12s to 15s.					
Hybrid New Cruzado F1	85 days	1.8 kg	11.5°	deep salmon	****	F 0-2 PMR 1-2, Sulfur
	A full-netted, medium size melon with a small cavity and exceptional internal color. New Cruzado has a good vine with great cover that produces great yields. Look t o New Cruzado F1 for exceptional quality. Sizes range from 12s to 15s.					
Hybrid Laser F1	80 days	1.5 kg	11.5°	deep salmon	****	F 0-2 PMR 2, Sulfur
	An early, full-netted melon in large size with a small cavity. Firm flesh and ropey net make Laser F1 an excellent shipper. Its large size and wide adaptability to different climates make laser a real winner. Sizes are primarily 9s with some 12s.					
Hybrid El Matador F1	85 days	2 kg	11.5°	deep salmon	****	F 0-2 PMR 1-2, Sulfur
	A main season, full net, super quality Western shipper with the highest quality and market appeal. A very nice deep round shape, tremendous yield potential, a vigorous vine and a small cavity make El matador F1 a must for growers and shippers alike. Sizes are primarily 12s.					
Eastern shipper						
Hybrid American Fun F1	80 days	1.7 kg	13°	deep salmon	****	F 1, PMR DMR, A
	American Fun F1is an Eastern type hybrid melon, similar to Saticoy, with a big oval shape, well netted, very firm fleshed with a musky taste. A must for anyone looking for a high quality Eastern type melon.					
Ananas type						
Hybrid Tunder F1	mid season	1.1 kg	12.5°	light salmon	***	F 0-2 PMR 1-2, Sulfur
	This melon belongs to the Ananas group. Tunder has light salmon flesh, very sweet and aromatic. It has a terrific package of disease resistance that will make this hybrid a winner where Ananas types are grown.					
Galia type						

Hybrid Green-Go F1	mid early	1.1 kg	13°	light green	***	PMR, Sulfur

A true Galia type, quite productive and with delicious aroma and taste. The cavity is very small and the yielding ability is quite high. Green-Go F1 is not recommended for long distance shipping.

Hybrid Green Star F1	mid season	1.1 kg	12.5°	light salmon	*****	PMR, Sulfur

Green Star is slightly largen than Galia, with firmer light green flesh and deeper tan-orange skin color at full maturity. This hybrid has proven ability to stand long distance transportation because of its good shelf life. It is a terrific yielder!

Pinonet / Piel de Sapo

Hybrid Sapomiel F1	full season	1.5 kg	15°	white	****	F 0-2 PMR, Sulfur

A very high quality Pinionet Piel de Sapo hybrid. Sapomiel F1 has no cavity and is very high in sugar. It is a very high yielding hybrid with a tremendous disease resistance package.

Rochet type

Hybrid Rocador F1	mid season	1.5 kg	13°	white	***	F 0-2 PMR, Sulfur

A Rochet type hybrid with moderate size but tremendous quality. Rocador F1 has high sugar, maintaining the typical taste, no cavity, and it gives high yields. It comes with a good package of disease resistances. A winner in its class!

Supermarket type

Hybrid Market Dream F1	very early	1.2 - 1.4 kg	13°	salmon	F 0-2, PMR
Hybrid Sweet America F1	early	1.0 - 1.2 kg	13°	salmon	F 0-2, PMR
Hybrid Sweet Eagle F1	mid season	1.5 - 1.8 kg	13°	salmon	F 0-2, PMR

Tendral Verde type

Hybrid El Moro F1	medium late	2.0 - 2.5 kg	15°	white	F 0-2, PMR

Yellow Canari type

Hybrid Tropigold F1	medium	2.0 - 2.5 kg	15°	white	F 0-2, PMR

Misc.

Hybrid Perfecto Blanco F1	late	2.0 2-2 kg	15°	white	F 0-2 PMR, Sulfur

This is a new hybrid melon with incredible taste and quality. This white, smooth skin melon has large size, delicious light green flesh, and very high degree of disease tolerance.

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Star Fire
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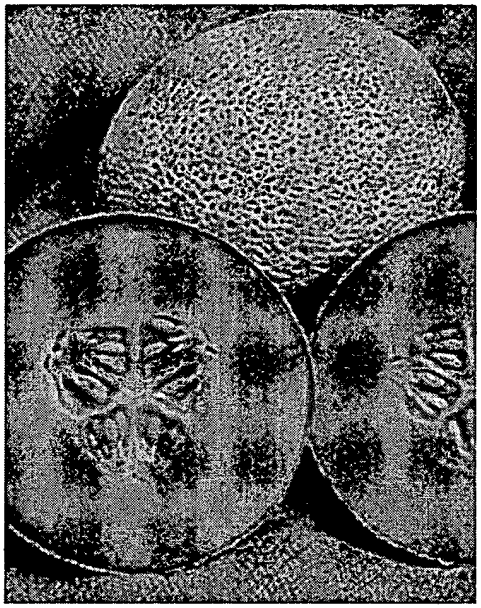
WESTERN
Archer
Cruiser
Gold Mine
Gold Rush
Nitro
Oro Rico
Rocket
Sparkle
Zodiac
HONEYDEW
Daybreak
HMX 4595
Honey Gold

Harris Moran

Hybrid cantaloupe - ORO RICO F1

- Uniform size & round shape
- Fast net formation
- Excellent shipping quality
- Exceptional yields



Very sweet, firm and crisp flesh for superior shipping and eating quality.

Oro Rico is an exciting main season cantaloupe from Harris Moran.

This extremely high quality melon has performed extremely well in California and Arizona. Oro Rico is a full-netted, western shipper with exceptionally high yields. The flesh is very firm and crisp, resulting in superior shipping characteristics.

The interior color is deep orange with a very well defined rind contrast. Soluble solids are consistently very high, even under stress conditions. This variety has shown tolerance to Powdery Mildew (race 1) and resistance to Fusarium Wilt (races 0, 2).

Tech sheet in PDF format >>>
Comparative table >>>

Information given is an average of data gathered from our test locations.
Your performance may vary depending on environmental and management conditions.
Please refer to the Harris Moran **Limitation of Warranty and Liability** before ordering.

HARRIS MORAN SEED COMPANY

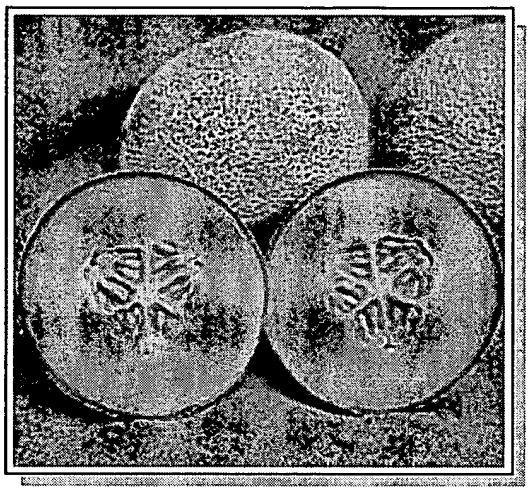
ORO RICO F 1

Western Melon

Very sweet, firm and crisp flesh for superior shipping and eating quality

Oro Rico is an exciting main season cantaloupe from Harris Moran. This extremely high quality melon has performed extrememly well in California and Arizona.

Oro Rico is a full-netted, western shipper with exceptionally high yields. The flesh is very firm and crisp, resulting in superior shipping characteristics. The interior color is deep orange with a very well defined rind contrast. Soluble solids are consistently very high, even under stress conditions. This variety has shown tolerance to Powdery Mildew (race 1) and resistance to Fusarium Wilt (races 0, 2).



ADVANTAGES

- ❑ Uniform size & round shape
- ❑ Fast net formation
- ❑ Excellent shipping quality
- ❑ Exceptional yields

ORO RICO F 1 — **ITEM NUMBER: 203588**

Relative Maturity:	Weight / Count:	Shape:	Rind / Net:	Flesh Color:
Main	3 - 4 lbs (1.6 - 2 kg) 12 - 15 - 18	Slightly oval	Sutureless with a coarse net	Deep orange

DISEASE RATINGS

Powdery Mildew:	Fusarium Wilt:
Tolerant (race 1)	Resistant (races 0, 2)

Information given is an average of data gathered from our test locations. Your performance may vary depending on environmental and management conditions. The complete Limitation of Warranty and Liability can be found in the Harris Moran Price List, at Harris Moran's website at www.harrismoran.com or by calling 1-800-320-4672. For more information about our products and services visit our website at www.harrismoran.com.

01/25/2001

ATCC

10801 University Blvd • Manassas, VA 20110-2209 • Telephone: 703-365-2700 • FAX: 703-365-2745

BUDAPEST TREATY ON THE INTERNATIONAL RECOGNITION OF
THE DEPOSIT OF MICROORGANISMS FOR THE PURPOSES OF PATENT PROCEDURE

INTERNATIONAL FORM

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT ISSUED PURSUANT TO RULE 7.3
AND VIABILITY STATEMENT ISSUED PURSUANT TO RULE 10.2

To: (Name and Address of Depositor or Attorney)

Cornell University
Attn: Molly Jahn
312 Bradfield Hall
Ithaca, NY 14853

Deposited on Behalf of: Cornell University

Identification Reference by Depositor:	**Patent Deposit Designation**
Cucumis melo(melon) breeding line: NY01-190-3R, -7L, -9L (composite)	PTA-3860

The seeds were accompanied by: _ a scientific description a proposed taxonomic description indicated above.
The seeds were received November 14, 2001 by this International Depository Authority and have been accepted.

AT YOUR REQUEST: X We will inform you of requests for the seeds for 30 years.

The seeds will be made available if a patent office signatory to the Budapest Treaty certifies one's right to receive, or if a U.S. Patent is issued citing the seeds and ATCC is instructed by the United States Patent & Trademark Office or the depositor to release said seeds.

If the seeds should die or be destroyed during the effective term of the deposit, it shall be your responsibility to replace them with viable seeds of the same.

The seeds will be maintained for a period of at least 30 years from date of deposit, or five years after the most recent request for a sample, whichever is longer. The United States and many other countries are signatory to the Budapest Treaty.

The viability of the seeds cited above was tested November 19, 2001. On that date, the seeds were viable.

International Depository Authority: American Type Culture Collection, Manassas, VA 20110-2209 USA.

Signature of person having authority to represent ATCC:

Date: November 21, 2001

Tanya Nunnally, Patent Specialist, Patent Depository

cc: Andrew Gonsalves

Budapest Treaty Deposits

American Type Culture Collection

10801 University Blvd., Manassas, VA 20110-2209
Phone (703) 365-2700; fax (703) 365-2745; e-mail applied-sci@atcc.org

TO DEPOSIT OR TO CONVERT A DEPOSIT TO MEET THE REQUIREMENTS OF THE BUDAPEST TREATY ON THE INTERNATIONAL RECOGNITION OF THE DEPOSIT OF MICROORGANISMS FOR THE PURPOSES OF PATENT PROCEDURE

ALL QUESTIONS MUST BE COMPLETED IN ENGLISH. PLEASE USE ONE FORM FOR EACH STRAIN DEPOSITED.

1. Name of deposit. **If microorganism,** give complete scientific name including genus and species and source of material; **if virus,** give name, whether plant or animal, and source including geographic location; **if cell line,** give tissue and species, geographical source of isolation, and any known hazards associated (HIV, EBV, etc.); **if genetic materials,** give name of organism from which vector, clone or library is derived, source of the DNA insert identified by species (e.g. human, mouse) or scientific name, and give name of gene and identity of the host organism; **if consortia or mixed culture,** each component of the mixture must be identified; **if seeds, embryos, insect eggs, etc.,** give common name, scientific name, and geographical source.
   Cucumis melo (melon) breeding line from Cornell University.

2. Strain designation (i.e., number, symbols, etc.) NY01-190-3R, -7L, -9L (composite)
   The strain designation must correspond with the vial labels.

3. Is this an original deposit under the Budapest Treaty? yes

4. Is this a request for a conversion of a deposit already at ATCC to meet the requirements of the Budapest Treaty? If so please indicate ATCC designation. no

5. Is this deposit a mixture of microorganisms or cells? no

6. Provide details necessary to cultivate, test for viability, and store deposit. If mixture, provide description of components and a method to check presence. If plasmid, provide name of host and antibiotic resistance.

7. Provide sufficient description so that ATCC may confirm deposit properties (e.g., Gram negative rod).
   melon seed

   a. If deposit is a cell culture, is it being cultured in the presence of antibiotics? If so, please list the antibiotics.

   b. If deposit is hybridoma, what is the isotype of antibody produced?

8. Is this strain hazardous to humans? no Animals? no Plants? no. If yes, what is the recommended biosafety level for working with this strain? _____. (Refer to Biosafety in Microbiological and Biomedical Laboratories, 4th ed. U.S. Dept. of Health and Human Services at www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm].

9. Availability: Prior to the issuance of a U.S. Patent, ATCC will only make a culture available as instructed by the depositor or relevant patent office. Samples must be provided to a specific investigator if a pertinent patent office under the Budapest Treaty instructs ATCC to do so. The following questions **must** be answered:

   a) As of date of deposit or conversion to meet the requirements of the Budapest Treaty, do you wish the deposit to be made available to anyone who requests a culture? If yes there are no restrictions on distribution. **Answering no will ensure the deposit is not available until the patent has issued.** Yes ____ No X

   b) As of date of deposit or conversion to meet the requirements of the Budapest Treaty, do you wish the deposit to be made available to requestors which satisfy patent offices in countries **not** signatory to the Budapest Treaty? Yes ____ No X
   If yes state which countries.

   Please note that if you are converting your deposit to meet the requirements of the Budapest Treaty and your deposit has already been released for distribution due to the issuance of a U.S. patent, you **cannot** restrict it from further distribution.

After a U.S. patent issues and we are so notified, ATCC makes the culture available to anyone who requests it, as allowed under USPTO Rules and Regulations (37 CFR 1.808 [a][2]).

10. ATCC will notify you of your ATCC number after confirmation of viability testing is complete.
Name of individual to notify: Molly Jahn
Fax: 607-255-6683 Phone: 607-255-8147 E-mail: mmk9@cornell.edu

11. Payment by check, or credit card (Mastercard, VISA or American Express), must accompany the deposit unless prior arrangements for billing have been made and approved. ATCC accepts Purchase Orders in the correct amount:

Purchase Order No. 96350 Check No. _____

Credit Card number. Please indicate MasterCard, VISA, or AE. _____

Exp. Date: _____ Name shown on card: _____
(Please type or print clearly.)

_____
Signature of card holder

PAYMENT: ATCC MUST HAVE A BILLING ADDRESS, CONTACT PERSON, PHONE AND FAX NUMBER FOR ALL DEPOSITS:
Cornell Research Foundation, Inc.
20 Thornwood Dr., Suite 105
Ithaca, NY 14850
Phone: 607-257-1081 Fax: 607-257-1015

12. Name, address, telephone and facsimile number of your attorney of record. Andrew Gonsalves, Nixon & Peabody
P.O. Box 31051, Rochester, NY 14603-1051 Ph: 716-263-1658
Fax: 716-263-1600 (Ref: Docket or Case No. _____)

13. **MUST BE COMPLETED.** Deposited on behalf of: (Verify with your management who owns the deposit. The owner is usually a company or institute and not an individual.) Cornell University

I understand and agree that the deposit may not be withdrawn by me for a period specified in Rule 9.1 of the Budapest Treaty (at least 30 years after the date of deposit or 5 years after the date of the most recent request for the deposit, whichever is longer), and that if a culture should die or be destroyed during the life of the patent or the period of time so specified, it is my responsibility to replace it with a living culture of the same organism or cell. In the cases of viruses, cell cultures, plasmids, embryos, and seeds, it is my responsibility to supply a sufficient quantity for distribution for the period of time specified above.

Molly Jahn — Molly Jahn — 13 November 2001
Typed Name — Signature — Date

Address: 312 Bradfield Hall, Cornell University, Ithaca, NY 14853
Phone: 607-255-8147 Fax: 607-255-6683 E-mail: mmk9@cornell.edu

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ADDRESS SHIPMENTS AND FORM TO THE ATTENTION OF:

Patent Depository
American Type Culture Collection
10801 University Blvd.
Manassas, VA 20110-2209 U.S.A.

STORAGE: Cultures are stored for 30 years from date of deposit or 5 years after the last request for a sample, whichever is longer, as required under the rules of patent offices in most countries.
FEES: For current fees, check our Web site at www.atcc.org, request a fee sheet by e-mail to applied-sci@atcc.org, or call (703) 365-2700 ext. 320. All fees are subject to change.

ATCC USE ONLY: ATCC DESIGNATION_____ REC'D _____ V.T. RESULT_____

Name of Deposit _____ Strain Designation: _____